



July 1, 1996

104986.ER.TA

Mr. Eric Newman
USEPA Region III (3HW23)
841 Chestnut Building
Philadelphia, PA 19107

Dear Mr. Newman:

Subject: Halby Chemical Expedited Response Action Oversight - Review of PRP Progress Report - Treatability Study

CH2M HILL has reviewed the Treatability Study Summary Progress Report dated June 17, 1996, prepared by ERM, Inc. on behalf of Witco Corporation and finds that the report provides mostly qualitative data, which makes it rather difficult to follow the test procedure, test results, and conclusions drawn. Statements made sometimes appear to be in conflict with the stated intentions outlined in the Introduction section. We find that many of the comments made by CH2M HILL on the work plan and the progress report dated May 8, 1996, are still valid and require incorporation or clarifications.

We therefore conclude that, at this time, it is speculative to make any conclusions based on the information provided in the report. As pointed out in Witco's letter to USEPA dated June 17, 1996, the assumption is that subsequent reports will provide additional information on various aspects of the testing.

Notwithstanding the comments of CH2M HILL already communicated to USEPA, we have the following items to note:

- Progress Report No.2 (dated May 6, 1996 and provided in Attachment A of Witco's progress report dated May 8, 1996) indicated that hydrogen peroxide would no longer be considered for further testing. However, the latest progress report discusses tests conducted using hydrogen peroxide. Has a final decision been made on the applicability of hydrogen peroxide?

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- Page 1-1, first paragraph: Please explain what the treatment goals are. What level of CS₂ constitutes unacceptable risk?
- Page 3-1, third paragraph: Please provide the chemical characterization of the non-Halby soil used in the experiments. Is a failure to react in hydrogen peroxide (page 5-1, fourth paragraph) the only indication that no organics were present?
- Page 3-1, fourth paragraph: How is the variability in CS₂ explained? With values ranging from 17,000 to 54,000 mg/kg for CS₂ (a variation of more than 200%) would it not be appropriate to report test results based on multiple (such as triplicate) analysis of each test sample instead of following the "averaging" method? How was this wide variation addressed in arriving at proper oxidant doses based on reaction stoichiometry?
- Page 3-1, fifth paragraph: It appears that averaging of CS₂ values based on the analyses of five split samples following homogenization defeats the objective of the testing program stated in the report in the Introduction section (i.e., "in a manner as representative of field conditions as possible" and "with limited pre-experiment homogenization so as to obtain representative analysis"). The question remains, then, as to how well the samples and experiments represent actual field conditions.
- Page 4-1, second paragraph: Please report the experiment details, including quantity of soil, corresponding oxidant strength, quantity and type used, volume of water added (if any), test duration, highest temperature recorded, other reaction conditions, etc. in a tabular form for each series of experiments conducted. This would greatly simplify understanding the procedures and results of the experiments.
- Page 4-2, third paragraph: Provide details of container size and type and how the containers were sealed.
- Page 5-1, second paragraph: Please state whether the analytical method employed to quantify CS₂ is an EPA-approved method.
- Page 5-1, third paragraph: If the calibration curve was based on 625 mg/kg to 5,000 mg/kg, how was 60 mg/kg measured? Do they mean that 60 mg/kg was the instrument detection limit? How was linearity of instrument response ascertained?

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- Page 5-1, third paragraph: How was the recovery ratio of 70 to 85 percent made use of when calculating the reduction of the percent of CS_2 ?
- Page 1, fourth paragraph: What sort of reaction was expected when the 50 percent peroxide was added to the non-spiked soil?
- Page 5-2, first paragraph: What is meant by "extrapolated *below* the lower standard value of 625 mg/kg" ?
- Page 5-2, second paragraph: Please provide the chemical reaction between CS_2 and OH^- .
- Table 1, referenced on page 5-2, third paragraph: Doesn't the "*" in the table actually mean "Below Detection Limit"? Also, please provide the actual CS_2 values used in arriving at the CS_2 changes reported; this comment is applicable to all tables.
- Figure 1, referenced on page 5-3, sixth paragraph: The plot indicates that the reaction temperature increases as the experiment goes back in time. The data used to generate the plot should be checked.
- Page 5-4, fourth paragraph: How was system temperature maintained at 34°C ? How was volatilization monitored and was it quantified? On comparison with the experiments in which the temperature rose to 80°C , what was the conclusion? Isn't it appropriate to expect increased volatilization at higher temperatures? If so, what was the rationale behind these experiments if the volatilization was not quantified? The rationale of starting at 0°C needs to be clarified.
- Page 5-6, first paragraph: The report initially states that an average CS_2 value of 34,000 mg/kg is considered indicative of the CS_2 concentration in the soil. However, Figure 3 is based on the "actual levels of CS_2 based on CLP method analysis." Why the deviation and how might it have affected the experiments, which were based on a concentration of 34,000 mg/kg?
- Page 5-6, second paragraph: It is stated that the temperature of the kettle was lowered by submerging the bottom of the kettle to remove the heat generated by the reaction. What was the kettle submerged into - water? Was the same method employed in experiments intended to measure the heat generated, as outlined in Section 5.2, page 5-4?

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- Table 5, referenced on page 5-6, fourth paragraph: Was the percent reduction of CS_2 in untreated soil with only buffer solution, noted with "---" (e.g., sample ID H-6) measured or was the reduction zero percent?
- Page 5-6, fourth paragraph: It appears that in Table 6, CS_2 conversion is based on actual initial CS_2 concentrations while the corresponding CS_2 removals noted in Table 3 are based on the "average" value of 34,000 mg/kg. What purpose does this change in basis serve? What effect does the increased reaction time of 8 hours (as opposed to 30 minutes) have on the volatilization of CS_2 ?
- Section 6.0: This section is not thorough. A clear discussion of the test purpose envisioned and how the results support and advance our knowledge of the CS_2 conversion process and the limitations of test results are needed. Issues related to varying values of initial CS_2 used in calculations, different oxidation times used in small- and large-scale experiments, and issues related to volatilization and temperature increase all deserve close attention. No mention is made of the products generated during the reaction, an item that deserves further analysis. No discussion is available of the COD values measured and what it might be telling us.
- Section 7.0: This is the first mention of COD results; the results should be discussed earlier, along with the pH values. What "COD-refractory" constituents might be present to cause an increase in COD by approximately 16,000 mg/kg? At this time, CH2M Hill believes that the information presented in the progress report is not sufficient to support the conclusions presented
- As a general comment, has any consideration been given to the fact that adding oxidizers to the soil may mobilize such metals as chromium, potentially compounding the contamination of the groundwater?

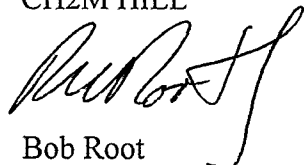
Please call me at 703/471-6405, ext. 4324, with any questions regarding this review.

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Sincerely,

CH2M HILL

A handwritten signature in black ink, appearing to read "Bob Root", written over the printed name.

Bob Root
Hydrogeologist

cc: Nagappa Sathish

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